

WE CLAIM:

1. An instrument for viewing a surgical site comprising
a shaft having proximal and distal ends;
a support member attached to one of said proximal and distal ends
of said shaft;
camera mounting means pivotally attached to said support member;
a video camera carried by said camera mounting means; and
operating means for pivoting said camera mounting means relative
to said support member so as to alter the viewing angle of said camera.
2. An instrument according to claim 1 wherein said camera is
releasably attached to said camera mounting means.
3. An instrument according to claim 1 further including a camera cable
connected to said camera for carrying video image signals from said
camera to apparatus for processing said signals and generating a video
display of the image seen by said camera.
4. An instrument according to claim 1 further including a multifunction
camera cable connected to said camera comprising means for transmitting
light to an object viewed by said camera and means for carrying video
image signals from said camera to apparatus for processing said signals
and generating a video display of the image seen by said camera.

5. An instrument according to claim 1 wherein certain components of said operating means are carried by a second support member attached to the other of said proximal and distal ends of said shaft.

6. An instrument according to claim 1 wherein said operating means comprises actuating means carried by said second support member.

7. An instrument according to claim 6 wherein said operating means for pivoting said camera mounting means comprises flexible cable means connecting said camera mounting means and said actuating means.

8. An endoscope according to claim 7 wherein said shaft has an internal passageway and said cable means comprises a flexible cable that extends within said passageway between said actuating means and said camera mounting means.

9. An instrument according to claim 6 wherein said actuating means comprises a manually rotatable actuating member rotatably attached to said second support member, and said cable means is coupled to said actuating member.

10. An instrument according to claim 1 wherein said camera mounting means is a spring clip, and said camera is releasably gripped by said spring clip.

11. An instrument according to claim 1 wherein said shaft is hollow and malleable.

12. An instrument according to claim 1 wherein said shaft comprises a rod of flexible material and a malleable metal member extending lengthwise through said rod.

13. An instrument according to claim 12 wherein said operating means comprises a flexible operating cable, and said rod has two parallel lumens through which extend portions of said flexible operating cable.

14. An endoscope in accordance with claim 11 wherein said shaft comprises a first helical coil member defining a passageway, and a second helical coil member surrounding said first helical coil member.

15. An endoscope comprising:

an electronic camera;

a shaft having proximal and distal ends;

means pivotally connecting said camera to said distal end of said shaft;

a flexible cable connected to said camera and extending outside and lengthwise of said shaft, said cable comprising electrical wiring for electronic image transmission; and

means for pivoting said camera relative to said distal end of said shaft.

said shaft being manually reformable with respect to its lengthwise configuration so that (a) it may be bent to a selected shape to facilitate access to a surgical site and (b) is adapted to remain in said selected shape until manually reformed to another shape.

16. A viewing instrument comprising:

a shaft having proximal and distal end, said shaft comprising a tubular structure that is malleable in the sense that it is shape retentive with respect to its lengthwise configuration until it is bent to a new shape, whereby said shaft may be manually reformed into a selected lengthwise configuration for access to a viewing site and is adapted to remain in such selected lengthwise configuration until manually moved to another configuration;

a viewing device support attached to said distal end of said shaft;
viewing device mounting means pivotally attached to said support;
a viewing device releasably attached to said viewing device mounting means; and

operating means for pivoting said viewing device mounting means on said viewing device support, whereby to move said viewing device so as to change the viewing angle of said viewing device, said operating means comprising driver means mounted to said proximal end of said shaft, and motion translating means connecting said driver means and said viewing device mounting means.

18. An instrument in accordance with claim 17 further including a support member attached to the proximal end of said shaft, and further wherein said viewing device mounting means comprises an axle rotatably mounted to said viewing device support, said driver means comprises a rotatable member carried by said support member, and said motion translating means comprises a flexible cable having first and second strands extending between and connected to said axle and said rotatable member so that movement of said rotatable member will cause said cable strands to rotate said axle and thereby produce pivotal movement of said

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viewing device mounting means and said viewing device relative to said shaft.

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19. An instrument in accordance with claim 17 wherein said viewing device is a video camera.

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20. An instrument in accordance with claim 19 further including:
a camera cable having first and second ends with said first end being attached to said camera, said camera cable including a plurality of electrical conductors for transmission of electronic signals produced by said camera that are representative of the optical image sensed by said camera, and a plurality of optical fibers for transmitting light to a site viewed by said video camera; and

means attached to said second end of said camera cable for (a) connecting said electrical conductors to means for processing the electronic signals generated by said camera and (b) connecting said optical fibers to a light source.

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21. An endoscope comprising:
a video camera;
a shaft having proximal and distal ends;
a camera support with said camera releasably attached to said camera support, said camera support being pivotally attached to said shaft by a first pivot shaft that is rotatably coupled to said distal end of said shaft; and
camera-pivoting means for pivoting said camera support so as to alter the viewing angle of said camera, said camera-pivoting means comprising a second pivot shaft that is rotatably attached to said proximal end of said shaft, means for rotating said second pivot shaft, and a motion translating

means extending between and coupled to said first and second pivot shafts for causing rotational movement of said first pivot shaft in response to and in synchronism with rotational movement of said second pivot shaft.

22. An endoscope according to claim 21 wherein said shaft motion translating means comprises a flexible operating cable that extends through at least one lumen in said shaft between said first and second pivot shafts.

23. An endoscope according to claim 22 wherein said operating cable embraces and is pinned to said first and second pivot shafts.

24. An endoscope according to claim 23 further including a first guide member disposed adjacent to said first pivot shaft, and further wherein said operating cable is arranged in a figure 8 configuration about said first pivot shaft and said guide member.

25. An endoscope according to claim 24 further including a second guide member disposed adjacent to said second pivot shaft, and further wherein said operating cable is arranged in a figure 8 configuration about said second guide member and said second pivot shaft.

26. An endoscope according to claim 23 further including manually operable means for rotating said second pivot shaft clockwise or counterclockwise.

27. An endoscope according to claim 22 wherein said operating cable makes more than one turn about at least one of said pivot shafts.

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An endoscope comprising:

a shaft having first and second opposite ends and an internal passageway extending between said first and second ends;

first and second support means attached to said first and second ends respectively of said shaft;

first and second axles connected to said first and second support means, said axles extending transversely to the longitudinal axis of said shaft and being rotatable on their own axes relative to said support means;

an imaging device carrier attached to said first axle so as to rotate therewith;

means attached to said second axle for rotating said second axle on its own axis; and

a loop of a flexible, stretch-resistant operating cable extending about and between said first and second axles, said loop being movable in response to rotation of said first axle and capable of causing said first axle to rotate in synchronism with said second axle.

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An endoscope according to claim 28 wherein said operating cable is under tension, and further wherein said first and second axles are releasably maintained in connection with said first and second support means respectively by a restraining force exerted thereon by said operating cable as a result of said tension.

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An endoscope according to claim 28 wherein said second support means is slidable lengthwise of said shaft, and further including spring means urging said second support means in a direction to maintain tension in said cable.

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31. An instrument comprising:
 a shaft having first and second opposite ends;
 first and second support means attached to said first and second ends respectively of said shaft;
 first and second axles connected to said first and second support means, said axles extending transversely to the longitudinal axis of said shaft and being rotatable on their own axes relative to said support means;
 a device attached to said first axle so as to rotate therewith, said device being a member of the group comprising a video camera, a laser, a magnetic or radiation sensor, a transducer, a surgical scissors, or a surgical grasper;
 means attached to said second axle for rotating said second axle on its own axis; and
 a loop of a flexible, stretch-resistant operating cable extending about and between said first and second axles, said loop being movable in response to rotation of said first axle and capable of causing said first axle to rotate in synchronism with said second axle.

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32. An instrument according to claim 31 wherein said cable undergoes a figure 8 routing at each of said first and second axles.

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33. An instrument according to claim 31 wherein said shaft has at least one internal passageway extending between said first and second ends thereof, and further wherein said cable passes through said at least one internal passageway between said first and second axles.

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